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PATENT ABSTRACTS OF JAPAN

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(71)Applicant : PACIFIC IND CO LTD

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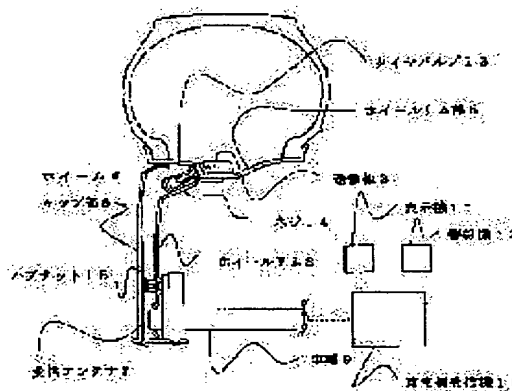
(72)Inventor : SAEKI SETSUHIRO

(54) TIRE AIR PRESSURE ALARM DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To stabilize the receiving state of a tire air pressure alarm device by installing a receiving antenna at a wheel cap close to a transmitter, and connecting the receiving antenna to a receiver in a cabin via the wheel cap, a wheel rim and an axle.

SOLUTION: A tire air pressure alarm device is provided with a pressure detecting element for detecting tire air pressure; a transmitter 3 fastened to a wheel rim part 5 and provided with a radio transmitter for transmitting the information of the pressure detecting element, and a transmitting antenna of the radio transmitter; a receiving antenna provided as a vehicle body side antenna at a wheel cap 6; and a receiver 10 in a cabin connected to the antenna 7 through a wheel rim 8 and an axle 9. On the basis of received information obtained by the receiver 10, the tire air pressure alarm device alarms pressure drop through a display 11 and an alarm 12.



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LEGAL STATUS

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CLAIMS

[Claim(s)]

[Claim 1] A pressure-taking element 1 which detects a tire pressure, and an electric wave transmitter 2 which transmits information on the pressure-taking element 1 concerned, A transmitter 3 which fixed in the wheel rim section 5 possessing a transmitting antenna 4 of said electric wave transmitter 2, A receiving antenna 7 formed in a wheel cap 6 as an antenna by the side of the body, A tire-pressure alarm characterized by carrying out the alarm of the fall of pneumatic pressure with a drop 11 and an alarm 12 based on receipt information obtained with a receiver 10 of the vehicle interior of a room connected through a wheel rim 8 and an axle 9 from this antenna 7, and said receiver 10.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the tire-pressure alarm of the radio system which can check the propriety of the tire pressure for automobiles by the vehicle room side.

[0002]

[Description of the Prior Art] As conventionally shown in drawing 3 and drawing 4, as a pressure detection machine 18 by the side of a tire, it was installed in the interior of a tire, it has the power supply using a cell 19, and the wireless transmitter 20, a signal is transmitted by actuation of the inflation pressure switch 21, and the equipment of receiving and carrying out the alarm of it with the antenna by the side of the body is proposed.

[0003]

[Problem(s) to be Solved by the Invention] However, since an electric wave was greatly influenced of a metal body, depending on the installation, the transmitting engine performance fell remarkably, and the antenna by the side of the body had the problem that an electric wave could not be received to stability or it could not receive at all to it.

[0004] It connects with the receiver of the vehicle interior of a room via the axle with which the wheel rim to which a receiving antenna is installed in the wheel cap near [in order to avoid the effect of a metal body in order to have been made in order that this invention might solve the above troubles, to obtain higher field strength and to stabilize a receive state] a transmitter, and a wheel cap is fixed, and a wheel rim are fixed, and is made to carry out the alarm of the fall of pneumatic pressure with a drop and an alarm based on receipt information.

[0005]

[Means for Solving the Problem] The pressure-taking element 1 for which a tire-pressure alarm of this invention detects a tire pressure, The transmitter 3 which fixed in the wheel rim section 5 possessing the electric wave transmitter 2 which transmits information on the pressure-taking element 1 concerned, and the transmitting antenna 4 of said electric wave transmitter 2, The receiving antenna 7 formed in a wheel cap 6 as an antenna by the side of the body, It is made to carry out the alarm of the fall of pneumatic pressure with a drop 11 and an alarm 12 based on receipt information obtained with the receiver 10 of the vehicle interior of a room connected through a wheel rim 8 and an axle 9 from this antenna 7, and said receiver 10.

[0006]

[Embodiment of the Invention] Hereafter, the example of this invention is explained based on a drawing. The transmitter 3 possessing the pressure-taking element 1 which drawing 1 shows the configuration by the side of the tire of the tire-pressure alarm by this invention, and detects a tire pressure, the electric wave transmitter 2 which transmits the information on the pressure-taking element 1 concerned, and the transmitting antenna 4 of said electric wave transmitter 2 is being fixed by root Motobe of a tire valve 13 in the wheel rim section 5. Moreover, said tire valve 13 is being fixed to the wheel rim section 5 with the screw 14 formed in the edge, a receiving antenna 7 is formed in a wheel cap 6, and this receiving antenna 7 is electrically connected with the wheel rim 8. Moreover, the wheel rim 8 is being fixed to the axle 9 by the hub nut 15.

[0007] Drawing 2 (A) shows the block configuration by the side of the tire of a tire-pressure alarm, a transmitter 3 consists of a pressure-taking element 1 which detects a tire pressure, and a transmitting antenna 4 of the electric wave transmitter 2 which transmits the information on the pressure-taking

element 1 concerned, and said electric wave transmitter 2, and this transmitter 3 fixes it for it in the wheel rim section 5.

[0008] The block configuration by the side of the body of a tire-pressure alarm is shown, a receiving antenna 7 is formed in a wheel cap 6, it connects with the receiver 10 of the vehicle interior of a room through a wheel rim 8 and an axle 9, and drawing 2 (B) has come to be able to carry out the alarm of the fall of pneumatic pressure with a drop 11 and an alarm 12 based on the receipt information obtained with said receiver 10.

[0009]

[Function of the Invention] By drawing 2, if actuation of a tire-pressure alarm is explained, as a transmitter 3 by the side of a tire, signal processing of the detection value of the pressure-taking element 1 of a pressure will be carried out with a microcomputer etc., and it will transmit pressure data by wireless.

[0010] The signal received on the other hand with the receiving antenna 7 installed in the wheel cap is inputted into the selecting switch 16 of the receiver 10 in the body via a wheel rim 8 and an axle 9. 16 is changed to the one where the receiving reinforcement is strong, and said selecting switch chooses one of signals from the antenna of a total of four front and rear, right and left.

[0011] Said control unit 17 displays a pressure value with a display based on the data obtained from control of a selecting switch 16, processing of an input signal, and processing, or emits an alarm with an alarm, or to be able to display, it is constituted and it is programmed.

[0012] Generally, the field strength by the electric wave can calculate the attenuation theoretically, and is solved in the free space. However, if it is in the space which has a metal body called a vehicle in the perimeter like this invention, to an electric wave being continuous relation of electric field and a magnetic field, by reflection by existence of a metal, absorption, and diffraction, it will decrease and the distribution will also be confused greatly.

[0013] In the example of measurement of the field strength when setting a receiving antenna to the vehicle interior of a room The output reinforcement of the feeble wireless by which the field strength in the free space of the transmitter installed in the tire was regulated legally declines greatly to having been 54db microvolt/m at 3m point. The degree of 2 - 20db microvolt/m, its attenuation, and fluctuation was large very much, and in view of the sensitivity of a receiver, it was very difficult to receive to stability, and it was lacking in practicality. For this cure, the complicated system in a receiving system and antenna system is required, and it will become unreal in cost as a tire-pressure alarm using the feeble wireless used in public welfare.

[0014]

[Effect of the Invention] As mentioned above, in order to stabilize a receive state, to avoid the effect of a metal body and very to enable installation of near and a big receiving antenna to a transmitter, a receiving antenna is formed in a wheel cap, and it connects with the receiver of the vehicle interior of a room through the axle with which the wheel rim to which a wheel cap is fixed, and a wheel rim are fixed, and the pneumatic pressure alarm of this invention is made to carry out the alarm of the fall of pneumatic pressure with a drop and an alarm based on receipt information.

[0015] According to the experiment, it was checked by detaching the distance of an antenna 5cm from a metal body that the field strength carries out a 5-10db microvolt/m rise. Moreover, in recent years, most is resinified and, also at the lowest, the wheel cap was able to secure field strength m more than in 10 db(s) microvolt /. Moreover, it is very easy to install an antenna in a wheel cap, the cost is [that there must be an antenna with an electric wire with a certain length] also slight, and the practical use value is very large.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The tire side block diagram of the tire-pressure alarm by this invention.

[Drawing 2] The block block diagram of the tire-pressure alarm by this invention is shown, for (A), it is a tire side block block diagram, and (B) is a body side block block diagram.

[Drawing 3] The block diagram of the conventional tire-pressure alarm.

[Description of Notations]

- 1 Pressure-Taking Element 2 Electric Wave Transmitter
- 3 Transmitter 4 Transmitting Antenna
- 5 Wheel Rim Section 6 Wheel Cap
- 7 Receiving Antenna 8 Wheel Rim
- 9 Axle 10 Receiver
- 11 Drop 12 Alarm
- 13 Tire Valve 14 Screw
- 15 Hub Nut 16 Selecting Switch
- 17 Control Unit 18 The Conventional Pressure Detection Machine
- 19 Cell 20 Wireless Transmitter
- 21 Inflation Pressure Switch

[Translation done.]

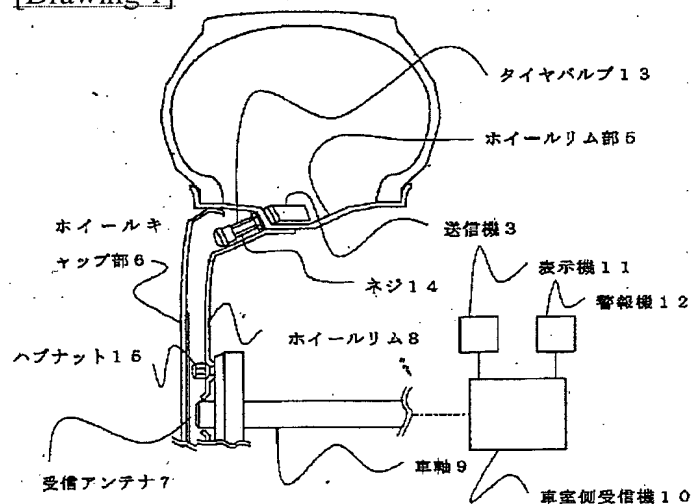
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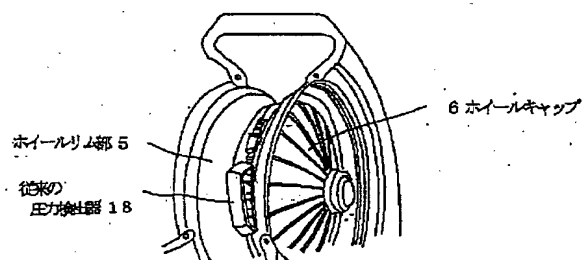
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DRAWINGS

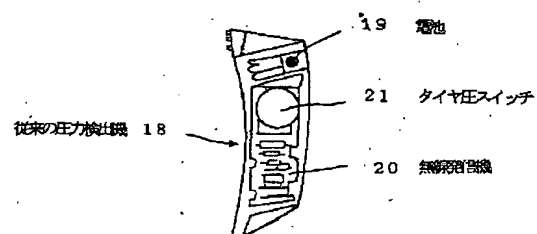
[Drawing 1]



[Drawing 3]

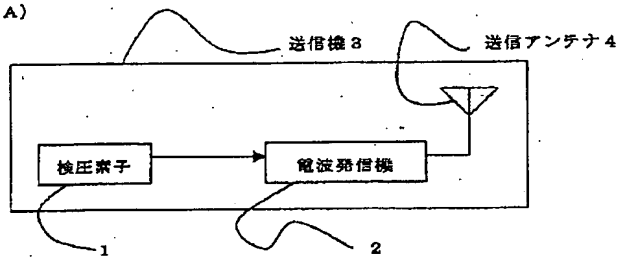


[Drawing 4]

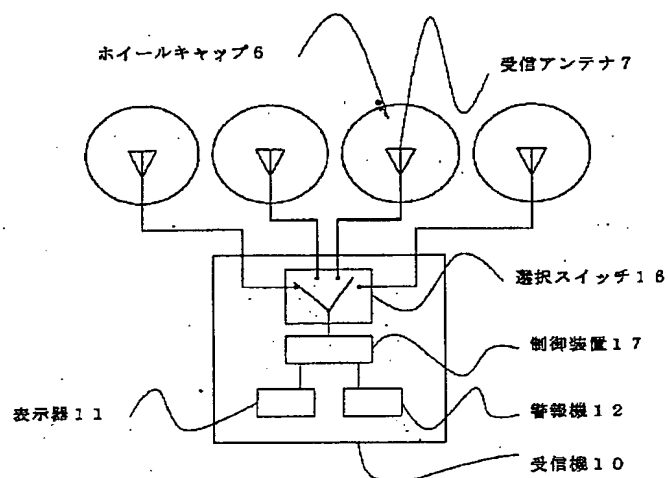


[Drawing 2]

(A)



(B)



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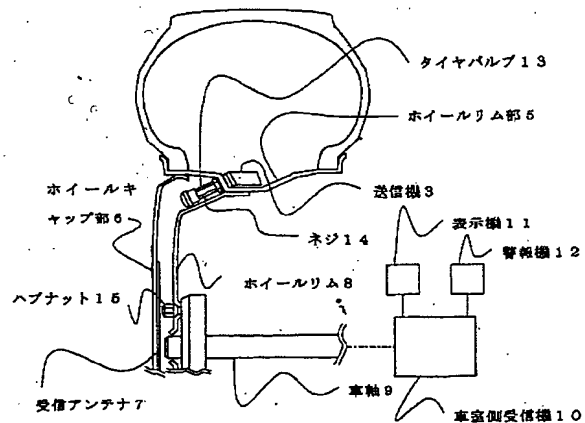
株式会社内

(54) 【発明の名称】 タイヤ空気圧警報装置

(57) 【要約】

【目的】 本発明は、送信機に近いホイールキャップに受信アンテナを設置し、ホイールキャップとホイールリムと車軸を経由して、車室内の受信機に接続することにより、空気圧警報装置の受信状態を安定させる。

【構成】 タイヤ空気圧を検出する検圧素子1と、当該検圧素子1の情報を送信する電波発信機2と、前記電波発信機2の送信アンテナ4とを具備する、ホイールリム部5に固着した送信機3と、車体側のアンテナとしてホイールキャップ6に設けた受信アンテナ7と、該アンテナ7よりホイールリム8、車軸9を介して接続された車室内の受信機10と、前記受信機10で得られる受信情報を元に表示器11や、警報機12により空気圧の低下を警報することを特徴としたタイヤ空気圧警報装置である。



【特許請求の範囲】

【請求項1】タイヤ空気圧を検出する検圧素子1と、当該検圧素子1の情報を送信する電波発信機2と、前記電波発信機2の送信アンテナ4とを具備する、ホイールリム部5に固着した送信機3と、車体側のアンテナとしてホイールキャップ6に設けた受信アンテナ7と、該アンテナ7よりホイールリム8、車軸9を介して接続された車室内の受信機10と、前記受信機10で得られる受信情報を元に表示器11や、警報機12により空気圧の低下を警報することを特徴としたタイヤ空気圧警報装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、自動車用タイヤ空気圧の適否を車室側で確認出来る無線方式のタイヤ空気圧警報装置に関するものである。

【0002】

【従来の技術】従来、図3、図4に示すように、タイヤ側の圧力検出機18としてはタイヤの内部に設置され、電池19を用いた電源と、無線発信機20とを備えていて、タイヤ圧スイッチ21の作動で信号を送信し、それを車体側のアンテナで受信し警報するという装置が提案されている。

【0003】

【発明が解決しようとする課題】しかしながら、電波は金属体の影響を大きく受けるため、車体側のアンテナはその設置場所によっては著しく送信性能が低下してしまっており、安定に電波を受信できなかつたり、全く受信できないという問題があった。

【0004】この発明は、上記のような問題点を解決するためになされたもので、より高い電界強度が得られ受信状態を安定化させるためや、金属体の影響をさけるために、送信機に近いホイールキャップに受信アンテナを設置し、ホイールキャップが固定されるホイールリムとホイールリムが固定される車軸を経由して、車室内の受信機に接続し、受信情報を元に表示器や、警報機で空気圧の低下を警報するようにしたものである。

【0005】

【課題を解決するための手段】本発明のタイヤ空気圧警報装置は、タイヤ空気圧を検出する検圧素子1と、当該検圧素子1の情報を送信する電波発信機2と、前記電波発信機2の送信アンテナ4とを具備する、ホイールリム部5に固着した送信機3と、車体側のアンテナとしてホイールキャップ6に設けた受信アンテナ7と、該アンテナ7よりホイールリム8、車軸9を介して接続された車室内の受信機10と、前記受信機10で得られる受信情報を元に表示器11や、警報機12により空気圧の低下を警報するようにしたものである。

【0006】

【発明の実施の形態】以下、本発明の実施例を図面に基づいて説明する。図1は、本発明によるタイヤ空気圧警

報装置のタイヤ側の構成を示し、タイヤ空気圧を検出する検圧素子1と、当該検圧素子1の情報を送信する電波発信機2と、前記電波発信機2の送信アンテナ4とを具備する送信機3は、ホイールリム部5内においてタイヤバルブ13の根元部に固定されている。また、前記タイヤバルブ13は、その端部に設けられたネジ14でホイールリム部5に固定されており、ホイールキャップ6には受信アンテナ7が設けられ、該受信アンテナ7はホイールリム8と電気的に連結されている。また、ホイールリム8は、車軸9にハブナット15にて固定されている。

【0007】図2(A)は、タイヤ空気圧警報装置のタイヤ側のブロック構成を示し、送信機3は、タイヤ空気圧を検出する検圧素子1と、当該検圧素子1の情報を送信する電波発信機2と前記電波発信機2の送信アンテナ4とで構成され、該送信機3はホイールリム部5に固着されるようになっている。

【0008】図2(B)は、タイヤ空気圧警報装置の車体側のブロック構成を示し、ホイールキャップ6に受信アンテナ7を設け、ホイールリム8と車軸9を介して車室内の受信機10に接続し、前記受信機10で得られる受信情報を元に表示器11や、警報機12で空気圧の低下を警報できるようになっている。

【0009】

【発明の作用】図2で、タイヤ空気圧警報装置の動作を説明すると、タイヤ側の送信機3としては、圧力の検圧素子1の検出値はマイコンなどで信号処理され、無線によって圧力データを送信するようになっている。

【0010】一方、ホイールキャップに設置された受信アンテナ7で受信された信号は、ホイールリム8と車軸9を経由して車体内の受信機10の選択スイッチ16に入力される。前記選択スイッチ16は、その受信強度の強いほうに切り替えられて、前後左右合計4本のアンテナからどれかの信号を選択するようになっている。

【0011】前記制御装置17は、選択スイッチ16の制御や受信信号の処理、処理から得られるデータをもとに圧力値を表示装置で表示したり、警報装置で警報を発したり、表示出来るように構成され、プログラムされている。

【0012】一般に、電波による電界強度は、その自由空間ではその減衰は、理論的に計算でき説明されている。しかし本発明のように、車という金属体を周囲に持つ空間にあっては、電波が電界、磁界の連続的なつなぎであるのに対し、金属の存在による反射、吸収、回折によって、減衰し、その分布も大きく乱れてしまう。

【0013】車室内に受信アンテナをおいたときの電界強度の測定例では、タイヤ内に設置された発信機の自由空間での電界強度が、法的に規制された微弱無線の出力強度が3m地点で54dBμV/mであったのに対し大きく減衰してしまい、実に、2〜20dBμV/mとそ

の減衰、変動の度合いは大きく、また受信機の感度からみても安定に受信するというのは非常に難しく、実用性に乏しかった。この対策のためには、受信系、アンテナ系での複雑なシステムが必要であり、民生的に使う微弱無線を利用したタイヤ空気圧警報装置としては、コスト的に非現実的なものになってしまう。

【0014】

【発明の効果】以上のように、本発明の空気圧警報装置は、受信状態を安定させるためや、金属体の影響をさけるために、送信機に極めて近く、また大きな受信アンテナを設置可能とするためにホイールキャップに受信アンテナを設け、ホイールキャップが固定されるホイールリムとホイールリムが固定される車軸を介して車室内の受信機に接続し、受信情報を元に表示器や、警報機で空気圧の低下を警報するようにしたものである。

【0015】実験によれば、金属体よりアンテナの距離を5cm離す事で、その電界強度は、5~10db μ V/mアップする事が確認された。また、近年では、ホイールキャップはほとんどが樹脂化されていて、最低でも電界強度を10db μ V/m以上は確保することが出来た。また、アンテナは、ある長さを持った電線で有りさえすればよく、ホイールキャップにアンテナを設置する

のは極めて容易で、そのコストも僅かであり、その実用価値は極めて大きい。

【図面の簡単な説明】

【図1】 本発明によるタイヤ空気圧警報装置のタイヤ側構成図。

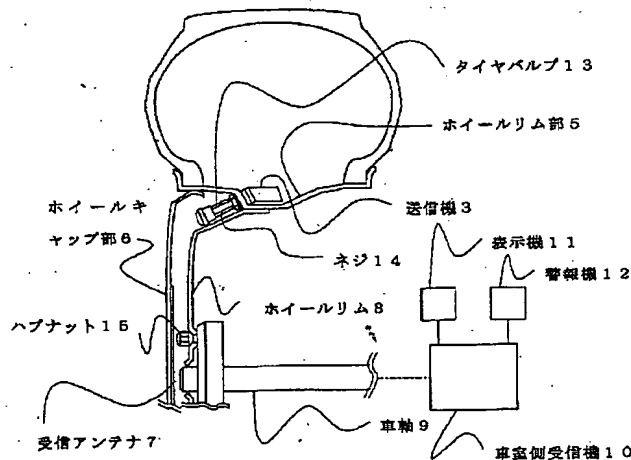
【図2】 本発明によるタイヤ空気圧警報装置のブロック構成図を示し、(A)はタイヤ側ブロック構成図、(B)は車体側ブロック構成図。

【図3】 従来のタイヤ空気圧警報装置の構成図。

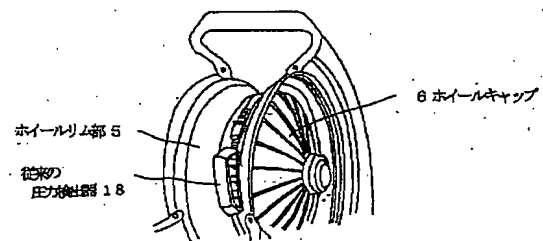
【符号の説明】

| | |
|-------------|-------------|
| 1 検圧素子 | 2 電波発信機 |
| 3 送信機 | 4 送信アンテナ |
| 5 ホイールリム部 | 6 ホイールキャップ |
| 7 受信アンテナ | 8 ホイールリム |
| 9 車軸 | 10 受信機 |
| 11 表示器 | 12 警報機 |
| 13 タイヤバルブ | 14 ネジ |
| 15 ハブナット | 16 選択スイッチ |
| 17 制御装置 | 18 従来の圧力検出機 |
| 19 電池 | 20 無線発信機 |
| 21 タイヤ圧スイッチ | |

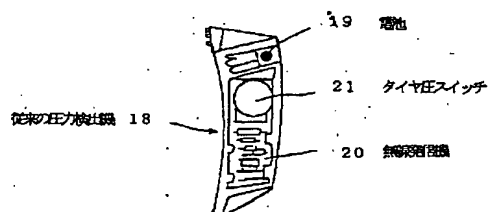
【図1】



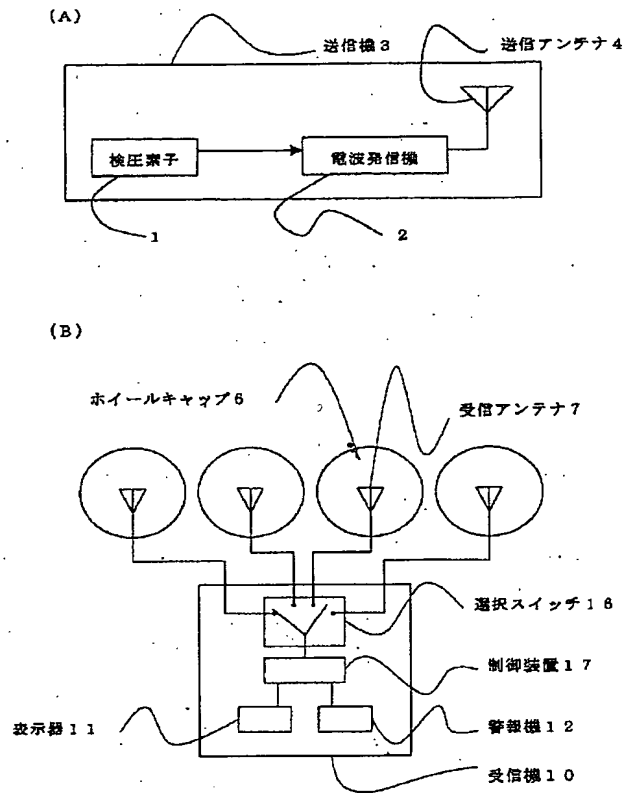
【図3】



【図4】



【図2】



【手続補正書】

【提出日】平成10年7月17日

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】図面の簡単な説明

【補正方法】変更

【補正内容】

【図面の詳細な説明】

【図1】 本発明によるタイヤ空気圧警報装置のタイヤ側構成図。

【図2】 本発明によるタイヤ空気圧警報装置のブロック構成図を示し、(A)はタイヤ側ブロック構成図、(B)は車体側ブロック構成図。

【図3】 従来のタイヤ空気圧警報装置の構成図。

【図4】 従来の圧力検出器の拡大縦断面図。

【符号の説明】

| | |
|-------------|-------------|
| 1 検圧素子 | 2 電波発信機 |
| 3 送信機 | 4 送信アンテナ |
| 5 ホイールリム部 | 6 ホイールキャップ |
| 7 受信アンテナ | 8 ホイールリム |
| 9 車軸 | 10 受信機 |
| 11 表示器 | 12 警報機 |
| 13 タイヤバルブ | 14 ネジ |
| 15 ハブナット | 16 選択スイッチ |
| 17 制御装置 | 18 従来の圧力検出器 |
| 19 電池 | 20 無線発信機 |
| 21 タイヤ圧スイッチ | |



Your ref: 15.77363
Application No: GB 0204633.2
Applicant: Labinal

Examiner: Jacob Collins
Tel: 01633 813710
Date of report: 17 September 2003

Latest date for reply: 17 March 2004

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Patents Act 1977

Examination Report under Section 18(3)

Basis of the examination

1. In the examination of your application I have taken account of the pages 8 & 9 you filed with your agent's letter of 27 February 2002 to amend the application as it was printed by WIPO during the international phase.

Novelty (section 1 (1)(a))

2. The invention as defined in claims 1 and 2 is not new because it has already been disclosed in the following documents:

JP 11-321255 A (PACIFIC IND CO LTD)
US 5033295 (SCHMID ET AL)

3. US 5033295 was known to the examiner. It is regretted that this document was not brought to your attention sooner.

4. JP 11-321255 and US 5033295 both disclose tyre pressure monitoring apparatus each having a rotating antenna disposed on a wheel and another fixed antenna disposed on the associated axle/spindle of the vehicle; where radio communication of the monitored tyre pressure takes place from the rotating antenna to the fixed antenna. Therefore claim 1 is anticipated.

5. JP 11-321255 and US 5033295 further disclose that the antennas are disposed in the vicinity of the free end of the axle. Thus claim 2 lacks novelty.

Inventive step (Section 1 (1)(b))

6. The invention as defined in claims 1-7 is obvious in view of what has already been disclosed in the following documents:

US 4075603 (SYNDER ET AL) See figure 3 in particular
EP 0563723 A1 (EURAFRICA)

7. US 4075603 and EP 0563723 were known to the examiner. It is regretted that these documents were not brought to your attention sooner.

8. US 4075603 and EP 0563723 both disclose tyre pressure monitoring apparatuses



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[Examination Report contd.]

which have a rotating antenna disposed on the wheel, in-line with the wheel's axle and another fixed antenna disposed elsewhere in the vehicle; where radio communication of the monitored tyre pressure takes place from the rotating antenna to the fixed antenna. The difference between the disclosures of these documents and claims 1-4 is the positioning of the fixed antenna. The skilled person would consider putting the fixed antenna at the free end of the axle, and coaxial with the rotating antenna because this would reduce the power needed to transmit the data from the wheel and also reduce interference between the various wheels on the vehicles. Therefore claims 1-4 are obvious in the light of either US 4075603 and EP 0563723.

9. The additional difference between the apparatuses disclosed in either US 4075603 and EP 0563723 and claims 5 -7 is the type of antennas used. Altering the type of antenna to that specified in the claims is a routine workshop modification that confers no unexpected benefits. Therefore claims 5 -7 lack the required inventive step from either US 4075603 and EP 0563723.